Integrated CNS Architecture – Future Directions

Topic: What are the goals and requirements of a long-term integrated CNS Architecture

Art Feinberg and Chris Wargo, Co-chairs

Integrated CNS Architecture – Future Directions

1 – What are the desired attributes of the long term ICNS architecture?

2 – What are the key technical requirements of the long-term ICNS architecture?

3 – What are the key technologies to focus on in developing long-term architecture candidates

Group Members

- Chris Wargo,CNS
- Art Feidberg. AMSI
- Gerald Chomos, NASA
- Brian Kachmar, Analex
- Paul Mallasch
- Noel Schmidt, ATC
- Mike Zernic, NASA
- Vincent Schultz, NASA
- Fred Messina, Raytheon
- Jocelyn Descaillot, SITA
- Richardo Parro, FAA
- Scott Remillard, Sensis
- Marty Pozesky, MTPA
- Kate Troop, Lockheed Martin
- Peter Harbath, Analex
- William Weiss, CSSI, Inc.
- Shigeki Masuda, JCAB
- Dan Williams, NASA
- Mitch Thomas, NASA
- Robert Zimmerman, Raytheon
- Mark Taylor, Avaliant LLC
- Paul Meredith, CNSA
- Mike Wedge, FAA
- David Underwood, Aviation Intl News
- Dave Olsen, FAA

Group Report

- Reviewed last year's session results for "revolutionizing CNS"
- Introduction of group members
- Overview of session
- Technologies capabilities do not require global standards
- Timeframe
  - Far enough out to influence long term systems
  - Involves two parts: target date and operational deployment
  - 2020 and beyond
  - Attributes includes standards independence
  - Aggressive thinking
  - 2010 system is deterministic (contracts in place)
  - Visualize architecture that takes advantage of technology
  - Think beyond current technology
- Architecture
  - Procedures, hardware, software are all part of architecture

Question 1

- 1 – What are the desired attributes of the long term ICNS architecture?
  - Security
  - Flexibility (equipage, cost)
    - Universal avionics (like software based radio)
    - UAVs, GA, wide body
    - Differing service levels
  - Design Standards Independence
    - Use public standards
    - Use better standards makers
    - Software independent radio
    - Protocol independence
  - Better leveraging of off the shelf products
    - Utilizing recent IP technologies
    - Other systems (commercial, public infrastructure)
    - Leverage Military CNS
  - Dynamic Scheduling
  - Cost Beneficial
    - Higher ROI and higher rate of change
    - Efficient use of equipment

Question 1 (continued)

- Business Side
  - Evolution
  - Concurrent evolution rather than serial
  - Prevent integration problems
- Performance
- Better Distribution of Weather Information
- Interoperability not Common Standards
- System Perspective (early CNS integration, not vertical C,N,S)
- Wireless Infrastructure, not necessarily SAT, VHF
- Integrated but not related to Wireless, not tying together equipment
- Information integration (weather information, surveillance, etc.)
- Moving from air traffic control to management
- Self determined Air Traffic Management (Collaborative)
- Not necessarily totally autonomous (restricted air space, other users)
- Some flexible components get autonomy
- Could user use system autonomously without worrying about other users
  - Could use and get more performance
  - More freedom
- Achieve autonomy when practical

Question 1 (continued)

- Responsibility consistent with user's performance
- Not trapped in system that in the future components won't apply anymore
- Freedom, not complete freedom
- Technology is letting the pilot be "his own controller"
- Fully digital

Question 2

- 2 – What are the key technical requirements of the long-term ICNS architecture?
  - Optimize channels for air to ground, air to air, etc. (minimize CNS links)
  - Integrate CNS functionality (network centric)
  - Situational awareness for all users
  - Networked with integrated displays
  - Sectors and classes refinement
  - CNS system that responds to dynamic sectors
  - Tools that allow communication loads, traffic loads (information loads) to be calculated for tests
  - User Intent
    - Part of situational awareness
  - Long term architecture that does not allow for single point failure
  - Redundancy
  - Diversity
  - Oceanic operation
  - Would not differentiate between ground or sea (global system)
  - Terrain independence (flexibility)
    - Transparent enough to work over different areas

Question 2 (continued)

- Real Time Information Sharing between all air space users
- Coverage for greater number of users and then migrate to everyone
- Delay has to appear to be zero or instantaneous to the user
- “Changing environment” vision
  - Expectation of better levels of safety
  - Better Efficiency
  - Increasing capacity
- Responsive to future environment (Concept of operation)
- Maintains large number of ground base radars
- Surveillance for safety and security
- Integrate ground based and satellite based surveillance systems
- Fulfills security requirements
- Normalizing or reducing long term operational cost
- Right type of business case

Question 3

- 3 – What are the key technologies to focus on in developing long-term architecture candidates
  - Secure Network technologies to support integration of CNS
  - Autonomic Systems (self monitoring, self maintaining)
  - Processor to interpret standards
  - Self configuring computers
  - Hybrid system engineering approach to integrate ground based and satellite based systems
  - Wireless broadband CNS implementation
  - Surveillance for backup and security
    - Non-cooperative surveillance system
    - May be ground based
    - Surveillance fusion
  - Integrated, universal display
  - Adequate situational awareness (virtual displays)
  - Protocols, Spectrum and Bandwidth research
  - Voice Synthesis and Response (voice recognition)
  - Ability to increase operability in all types of weather (make weather less of a factor of efficiency)

Question 3 (continued)

- Ability to increase operability in all types of weather (make weather less of a factor of efficiency)
  - Synthetic vision systems
- Closed width capture with total situation awareness
- Non-conforming flight objects decision support tool
- ILS (integrated logistics support), failure prediction system
- System engineering tools and processes to build system
- Aircraft tools integration
- Service availability in case of failures
- Better procedures
- Technology migration (software engineering)
  - Open system architecture
- Sensor improvements
  - New sensors
  - Order of magnitude improvements
- Minimizing Interference (RF)
  - Insuring GPS signal integrity